Case Report

Anterior Dislocation of the Radial Head with Plastic Bowing of the Ulna Introducing Modification to Bado’s Classification

S. Goyal, M.Ch(orth). A. Hussain M.Ch(orth).

ABSTRACT

We are reporting an unusual Monteggia fracture dislocation, which does not confirm to Bado’s classification. Isolated dislocation of the radial head with traumatic bowing of the ulna due to plastic deformation is an extremely rare injury. We report such a case in a three year old boy, diagnosed two weeks after injury. Containment of the radial head following open reduction was possible only after ulnar osteotomy.

We are proposing a modification to the time honoured Bado classification, applicable to paediatric age group.

A high index of suspicion in injuries around the elbow is essential to avoid late detection of this injury which is best diagnosed in the lateral view of the elbow including the whole forearm. This case also illustrates that even a short delay of a few days can make closed reduction impossible and open reduction difficult, without ulnar osteotomy.

INTRODUCTION

Dislocations of the elbow are not so common and comprise only 6% of elbow injuries. Dislocation of the radial head is even rarer and is usually associated with fracture of the proximal ulna.

Isolated dislocation of the radial head without fracture of the ulna is an extremely rare injury. Acute traumatic bowing of the forearm bones can occur, representing a plastic response to longitudinal stress. Only a few cases of anterior dislocation of radial head with plastic bowing of the ulna have been reported until now in literature.

We are reporting an extremely rare case of dislocation of the radial head with bowing of the ulna. This injury was missed on initial radiographs but was subsequently diagnosed and treated surgically with good functional result.

Since this injury does not confirm to Bado’s classification, our objective in presenting this rare injury is to highlight the importance of:

a) modification of the existing Bado’s classification to include the childhood pattern of Monteggia fracture-dislocation

b) high index of suspicion for early diagnosis and

c) importance of ulnar osteotomy.

CASE HISTORY

A three year old boy sustained injury to his left elbow following a fall. He attended the Accident and Emergency department with a painful and swollen elbow with limitation of movements but no neuro-vascular compromise. Radiographs of his elbow were regarded as normal. His arm was supported in a sling and was referred to the fracture clinic.

Four days later, he was seen in fracture clinic and was complaining of pain, swelling and restriction of movements of the elbow. He had reduced flexion, extension and supination. A minor subluxation of proximal radius was suspected to be the cause of his symptoms. He was given a clinic appointment to be reassessed in a week once the swelling had settled down.

A week later he was reviewed in clinic this time by the senior author. He still had pain in the elbow. There was tenderness over lateral aspect of the elbow. Movements of the elbow ranged from $30^\circ$ – $135^\circ$ of flexion with no possible rotation of the forearm.

Radiographs revealed anterior dislocation of the radial head and increased anterior bowing of the ulna (figure 1).

Under general anaesthetic, attempts at closed reduction were unsuccessful. Open reduction of the radial head, using Boyd’s approach was carried out and it was noted that radial head when reduced remained...
similar lesion found in childhood.

The lesion in children is believed to be different from that in adults because of higher resilience of tissues including bone. Plastic deformation of the ulna can occur because of recoil, in association with dislocation of the radial head while in adults the same injury can produce a markedly displaced fracture of ulna.

Letts devised a classification based on direction of dislocation of the radial head and type of ulnar fracture. Letts type A, is anterior bowing of the ulna due to plastic deformation. Following the osteotomy of the ulna, radial head reduced spontaneously. The radial head was held in place by passing a Kirschner wire through the capitellum and into the radial head. An above elbow plaster was applied. The plaster and Kirschner wire were removed at six weeks and active mobilisation of the elbow was gradually resumed. At 3 months, the patient was completely asymptomatic with full range of elbow movements and forearm rotation. Radiographs at this stage were very satisfactory (figure 2).

**DISCUSSION**

Monteggia fracture-dislocations have always been problem injuries. Giovanni Battista Monteggia reported this injury in 1814. Bado subsequently described 4 types of Monteggia lesions.

The most common (Type I) is a fracture of the proximal third of the ulna with anterior angulation of the fracture and anterior dislocation of the radial head. The second most common (Type II) is fracture of proximal ulna with posterior angulation of the fracture and posterior dislocation of the radial head. Lateral angulation of the proximal ulnar fracture may result in a rare Type III with a lateral dislocation of the radial head. Type IV is a proximal both bone fracture and anterior dislocation of the radial head. Type V was added later by Dormans and Rang, involving intermittent and habitual dislocation of the proximal radio-ulnar and radio-capitellar joints.

In addition to these lesions 3 types of “Monteggia equivalent” injuries have been described. 1) Isolated radial head dislocation. 2) Fracture of proximal ulna with fracture of the radial neck. 3) Proximal third fractures of both radius and ulna with radial fracture more proximal than the ulnar fracture.

Bado’s classification has been widely accepted as standard for adult lesion. It does not, however, refer to a similar lesion found in childhood.

Type B includes a greenstick fracture of the ulna with anterior dislocation of the radial head and type C is complete fracture of the ulna with anterior dislocation of the radial head, which is equivalent to Bado type I. Letts type D and type E were equivalent to Bado type II and type III. The limitation of Letts classification is that it does not identify Bado type IV as an entity and hence this is not included in their classification. Other authors have considered it as a variant of Bado type I. On the other hand, Rockwood emphasised the importance of Bado type IV lesion because of the importance of recognition and proper management of the radial fracture for successful treatment.

Considering the vast spectrum of classification systems mentioned in literature, Bado classification is still the most popular. Our case (figure 1) cannot be classified as Bado type I because of plastic deformation of the ulna in association with anterior dislocation of the radial head rather than a complete fracture, though it is similar to Letts type A.

We therefore, suggest that the time honoured Bado classification, which still holds good for adult fractures, should be modified to accommodate the equivalent fracture patterns seen in childhood. This modification takes into account the severity of injury and correspondingly the nature of ulnar fracture (in association with the direction of radial fracture, 6,7}
similarly be added to Bado types II-IV, where subtype B earlier but practically exists in other Bado types III and IV. (subtype B) is not limited to only Bado type I as described be classified as Bado type IIIB and Bado type IVB injuries. With our modification these injuries can therefore precisely occurring in these types, though not classified or reported.

It is obvious that the greenstick fracture pattern of ulna (subtype B) is not limited to only Bado type I as described earlier but practically exists in other Bado types III and IV. With our modification these injuries can therefore precisely be classified as Bado type IIIIB and Bado type IVB injuries.

Hence we suggest that subtypes A, B, C, injuries can similarly be added to Bado types II-IV, where subtype B (greenstick fracture of the ulna) and subtype C (complete fracture of the ulna), already exist in literature with the capability to classify subtype A (plastic bowing of the ulna) as in our modified Bado’s classification, if reported in future.

Monteggia fracture-dislocation is an uncommon injury in children. As reported by Borden in his article, “Blount (personnel communication) had seen anterior dislocation of the radial head with a bowed ulna but this was not reported”. Subsequently, Dormans and Rang reported plastic deformation of the ulna with dislocation of the radial head in 4 patients (8%) out of a series of 50 cases of Monteggia fracture dislocations. They emphasised that the injury pattern is usually unrecognised until the entire ulna is evaluated radiographically.

A plastic curvature should be suspected in a child with clinical forearm deformity without fracture or dislocation of one bone at the wrist or elbow. It is important to obtain correct radiographs of forearm that provide anterior-posterior and lateral projections of both the wrist and elbow. Dislocation of the radial head can be judged on radiographs by a line drawn through the centre of the radial neck and head which should extend directly through the centre of capitellum.

We think that in our case the initial radiograph was of an oblique projection of the elbow rather than a true lateral. This could have been the reason that the injury was missed in the first instance only to be picked up later by the senior author. These injuries may well be misdiagnosed or confused with ‘pulled-elbow’ where alignment of the radial head is maintained in line with the capitellum.

Even in a normal elbow the relationship of the radial head to the capitellum can be distorted if radiographs are taken with a pronated or obliquely placed forearm. A high index of suspicion and properly taken radiograph are therefore pertinent to accurate initial diagnosis.

Bowing of forearm if uncorrected, limits pronation and supination. This also resists attempts to relocate the dislocated radial head. Considerable force is required to correct the plastic deformity, the magnitude of force being equal to the force required to create it. It is likely that 100-150 percent of a child’s total body weight is required to reduce these curvatures. These forces are seldom attained by manipulative reduction (as in our case), but require an osteoclasis of the angulation to facilitate reduction. In our case because of the plastic deformation of the ulna we were unable to reduce the radial head. This eventually required osteotomy of the ulna and the radial head was held in the reduced position with a transcapitellar Kirschner wire. Use of transverse Kirschner wire from radius to ulna has been described, but we fear that it may cause radio-ulnar synostosis because of communication of haematoma.

Reconstruction of the annular ligament has been found to be necessary in late cases varying from 4 months to 3 years. However, in our case following ulnar osteotomy which was done at 2 weeks, radial head was well contained and annular ligament reconstruction was not necessary.

The patient had full functional recovery at 3 months follow-up.

CONCLUSION

Anterior dislocation of the radial head with traumatic anterior plastic bowing of the ulna is an extremely rare
impossible. Therefore it is important that cases seen even at this stage should be dealt with immediately.

There should be a high index of suspicion when dealing with an ulnar bowing in children and specific evaluation of elbow and wrist should be performed routinely. The deformity is best recognised with the forearm in a proper position on a true lateral radiograph which includes both wrist and elbow joints.

References